

A NOTE ON NORTH AMERICAN *TORREYCHLOA* (POACEAE),  
INCLUDING A NEW COMBINATION

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ABSTRACT

*Torreychloa* is morphologically distinct from *Glyceria* and *Puccinellia*, two genera with which it often has been associated closely; a recent phylogenetic analysis of representative species of Poaceae subfamily Pooideae, based on chloroplast DNA restriction site variation, supports the conclusion that these three genera are not closely related to one another within the subfamily. *Torreychloa* has been interpreted most often as comprising four or more species in North America, plus two others in eastern Asia. However, several authors, focusing on various combinations of these taxa, have brought the distinctness of all of these taxa into question. Herbarium studies suggest that just two species warrant recognition in North America, *T. pallida* (Torrey) Church and *T. erecta* (A. Hitchc.) Church. The former species is highly polymorphic; elements assignable to this species, and best recognized as varieties, include the type variety plus taxa that have been recognized as *T. fernaldii* (A. Hitchc.) Church and *T. pauciflora* (J.S. Presl) Church. A new combination for the latter taxon, as a variety of *T. pallida*, is proposed.

KEY WORDS: *Glyceria*, *Puccinellia*, *Torreychloa*, Poaceae

While preparing a taxonomic treatment of *Torreychloa* for the revised *Manual of North American Grasses*, I have examined the collections of CAS, RSA, UC, and US, a total of more than one thousand specimens. My conclusions will be summarized in the *Manual* treatment, but in association with the necessary publication of a nomenclatural adjustment it seemed useful to offer a brief review of the taxonomic history of *Torreychloa*, along with observations in support of the taxonomic changes I favor, and some comment on areas that warrant additional study.

In 1919, Church presented a comparative study of variation in morphological and cytological characters of *Glyceria* and *Puccinellia*. His analysis

revealed, first, that many characters differentiate these genera, and second, that a small group of species customarily included in *Glyceria*, on the basis of gross morphology, resemble *Puccinellia* more closely in several characters (e.g., leaf sheath open, lodicules hyaline and elongate, stigmas sessile on pistil, and base chromosome number  $x = 7$ , as in *Puccinellia*, vs. sheath closed, lodicules fleshy and usually truncate, styles present, and  $x = 10$ , in the remaining species of *Glyceria*). On the basis of these and other characters, Church segregated this group of species from *Glyceria* and treated them as the new genus *Torreyochloa*.

Shortly thereafter, Clausen (1952) suggested that the species of *Torreyochloa*, in line with the many characters they share with *Puccinellia*, should be assigned to the latter genus rather than maintained as a separate genus. Church (1952), in reply, reemphasized the differences between *Torreyochloa* and *Puccinellia*. Among the characters that differentiate these two genera are the prominence of lemma nerves in the former, vs. obscure nerves in the latter, and a series of characters of the pistil and caryopsis (Church 1952). Church has been followed in his recommendation that the species in question be removed from *Glyceria*, but authors have differed on the question of how they should be treated. In subsequent floristic works, these species have been recognized either as *Torreyochloa* (Welsh 1974; Dore & McNeill 1980), or as species of *Puccinellia* (e.g., Hitchcock 1969; Munz 1973; Holmgren & Holmgren 1977).

A recent phylogenetic analysis of chloroplast DNA restriction site variation in Poaceae subfamily Pooideae (Soreng, *et al.* 1990) included representatives of *Glyceria*, *Puccinellia*, and *Torreyochloa*. The results of that study are consistent with Church's contention that all three of these genera represent distinct lineages within the subfamily: *Glyceria* is grouped with the tribe Meliceae and *Puccinellia* with Poeae (both as expected), while *Torreyochloa* is grouped with Aveneae.

Six principal taxa are widely recognized in *Torreyochloa*, each at times as a species. Of these six, two occur in each of the following three regions: 1) eastern North America (*T. pallida* [Torrey] Church [the type species of the genus] and *T. fernaldii* [A. Hitchc.] Church); 2) western North America (*T. pauciflora* [J.S. Presl] Church and *T. erecta* [A. Hitchc.] Church); and eastern Asia (*T. natans* [V. Komarov] Church and *T. viridis* [Honda] Church). Additional taxa have been recognized by various authors, usually at the varietal level (cf. Hitchcock 1969; Munz 1973; Taylor & MacBryde 1978; Boivin 1981).

Despite the widespread recognition of six or more species of *Torreyochloa*, their distinctness, and hence their species status, has been called into question by various authors. Fassett (1946) presented evidence that *T. pallida* and *T. fernaldii* are only varietally distinct. Clausen (1952, p. 44) went further, in suggesting that all of the taxa in North America "comprise a series and essentially replace each other geographically and altitudinally," and that they "may all belong to a single polytypic species." Koyama & Kawano (1964)

interpreted the two eastern North American taxa and the two Asian taxa as constituting two vicariant pairs (*T. fernaldii* with *T. natans*; *T. pallida* with *T. viridis*), presented evidence that none of these four is distinct, and treated them as varieties of *T. pallida* (nested as pairs within two subspecies).

My observations, which have been limited to North American *Torreyochloa*, largely confirm those of Fassett (1946), Clausen (1952), and Koyama & Kawano (1964) concerning the absence of species distinctions among these taxa. In particular, I concur with Fassett (1946) in finding that, of the four principal North American taxa, the distinction that is most difficult to maintain is between the two eastern taxa, *T. fernaldii* and *T. pallida*. The reader is referred to Fassett's paper for a summary of characters that apportion many specimens, but not nearly all, to one of the two groups. Although a strong bimodality in form is evident, intermediate individuals are not rare. The geographic range of *T. fernaldii* extends from Newfoundland westward to the eastern prairie (plus a few disjunct sites farther to the north and west), and southward to West Virginia and Tennessee (Koyama & Kawano 1964; pers. obs.). The range of *T. pallida* sens. strict. extends from Nova Scotia westward to the eastern prairie, and southward, principally in the Appalachian Mountains, to Georgia. Thus, the ranges of these two elements are widely overlapping, with that of *T. fernaldii* extending farther to the north, and that of *T. pallida* farther to the south. Morphologically intermediate individuals appear to be limited to a range extending from southeastern Canada to Connecticut, and westward to Minnesota. Detailed population studies might clarify the nature of variation at sites at which intermediate individuals occur, but observations to date suggest that the taxon known as *T. fernaldii* is best recognized as a geographic variety of *T. pallida*.

My observations also detect no consistent difference between *T. pallida* and the principal western North American form, usually recognized as *T. pauciflora*. Western plants tend to be more robust in vegetative characters than eastern plants (20-142 cm vs. 18-110 cm tall; reproductive stems 1.3-4.8 mm vs. 0.6-3.0 mm in diameter at base; widest cauline leaf blades of reproductive stems 3.6-17.5 mm vs. 1.5-11.4 mm wide), while the lengths of anthers of western plants fall towards the lower end of the range observed in eastern specimens (0.5-0.7 mm vs. 0.3-1.5 mm long). However, as is evident from these ranges, the means and extremes may differ, but no diagnostic character consistently differentiates the groups.

The largest plants in western North America occur near sea level, and those from higher elevations are progressively smaller. Above ca. 2000 m, two groups of plants occur. One group bears compact, ovate to obovate panicles, ca. 6-10 cm long and ca. 2-3 times as long as wide; these plants have been recognized as *T. californica* (Beetle) Church, but a continuous series of intermediates between these and the robust coastal forms suggests that species status is not warranted. Plants of the second high elevation group, identifiable as *T. erecta*,

bear leaves  $\leq 7.2$  mm wide, and a linear panicle  $\leq 1.0$  cm wide and  $\geq 5.5$  times as long as wide. This character combination is unique in North America.

These observations together suggest that North American *Torreyochloa* is best recognized as comprising two species, the widespread and polymorphic *T. pallida* (sea level to 3500 m elevation, Newfoundland to Georgia and westward to the eastern prairie, plus Alaska to California and eastward to the Rocky Mountains) and *T. erecta* (2000-3500 m elevation in the Sierra Nevada and Cascade Ranges, in California, Nevada, and Oregon). If the eastern Asian taxa also are regarded as conspecific with *T. pallida*, as maintained by Koyama & Kawano (1964), the geographic range of this species is correspondingly greater. As discussed above, three principal geographic varieties of *T. pallida* can be distinguished in North America. The correct names for these taxa, at the varietal rank, are *T. pallida* var. *pallida*, *T. pallida* var. *fernaldii* (A. Hitchc.) Dore, and for the taxon previously recognized as *T. pauciflora*, the following new combination.

*Torreyochloa pallida* (Torrey) Church var. *pauciflora* (J.S. Presl) J.I. Davis, *comb. nov.* BASIONYM: *Glyceria pauciflora* J.S. Presl, in C. Presl, *Reliq. Haenk.* 1:257. 1830.

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